

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s) : Gerhard GROSS et al.  
Based on : PCT/EP 2005/050466  
Title : SLIDE BEARING  
Docket No. : R.308338  
Customer No. : 02119

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97(b),  
AND EXPLANATION OF THE RELEVANCE OF THE CITED PRIOR ART**

Sir:

The undersigned hereby requests that the prior art cited on the attached prior art statement be placed of record in the application file and be considered by the examiner.

This citation of prior art is made under 37 CFR 1.97(b), since it is being filed within three months of the filing date and before the mailing of a first Office action.

The relevance of the prior art cited on the attached form PTO/SB/08a is as follows:

**US 3,140,131**

No abstract available for this patent. It is cited to show state of the art.

**DE 1 285 793**

No abstract available for this patent. It is cited to show state of the art.

#### **DE 199 37 567 A1**

This patent shows the lubrication oil storages are formed by groove structures (15) with at least two longitudinal grooves (16) and at least in one part of the groove structures (15). One part of the groove undulations (16k), remains between the adjacent longitudinal grooves (16), making contact with the shaft received by the bearing bore (11), for the transfer of the lubricant. The reception volume of the longitudinal grooves (16r) of the groove structures (15) is matched to the volume of the lubricant displaced from the sintered material by the operation of the bearing.

#### **DE 198 09 770 A1**

This patent relates to the porous oil-impregnated bearing 1 comprises a bearing body 1a made of a porous material, and oil retained in the pores of the bearing body 1a by impregnation with lubricating oil or lubricating grease. The inner peripheral surface of the bearing body 1a is formed with a bearing surface 1b opposed to an outer peripheral surface of a shaft to be supported, with a bearing clearance defined there between. The bearing surface 1b has a first region m1 in which a plurality of hydrodynamic pressure generating grooves 1c inclined in one direction with respect to the axial direction are circumferentially disposed, a second region m2 which is axially spaced from said first region m1 and in which a plurality of hydrodynamic pressure generating grooves 1c inclined in the other direction with respect to the axial direction are circumferentially disposed, and an annular smooth region n disposed between the first and second regions m1 and m2.

#### **DE 196 28 241 A1**

This patent shows a bearing device wherein a porous body is formed with a bearing surface (5a) which comes in slide contact with the slide surface of a shaft (3) to be supported, while a porous oil-impregnated bearing (5) impregnated with a lubricating oil or lubricating grease and a solid resin lubricating composition (7) in the form of a synthetic resin substrate having a lubricating component dispersed and held therein are disposed in contact with each other.

#### **DE 101 07 486 A1**

This patent shows the running zone (3) of the sintered slide bearing (1) occupies at least one position dependent on the direction of loading, and has a running surface permeable to less lubricant by comparison with the other running surface. The running zone has sealed pores near the surface. The length of the running zone is adjustable in relation to the amount of loading exerted.

#### **DE 101 02 012 A1**

This patent shows a conventional bearing loses a provided lubricant from the external axial ends of the bearing. According to the invention, a bearing (1) is provided at both external axial ends (15, 17) with cavities (22), which work by capillary effect to retain the escaping lubricant (25) in the cavity (22).

**DE 43 42 902 A1**

This patent shows one end side (14,15) of the bearing (12) is provided between the shaft (10) and bearing (12) with a ring gap (17) whose expansion (16) reduces the capillary action so that the oil is fixed in the gap between the shaft and bearing. A radially expanding gap (24) can be provided between the end face of the bearing and a disc adjoining at least one of the end sides. The contact face between the disc (21) and a convex ring face formed coaxial with the bore (11) on at least one of the end faces of the bearing is kept to the smallest possible diameter. A centrifugal disc (25) can be seated fixed on the shaft (10) on the bearing side behind the disc (21).

**DE 1 575 551**

No abstract available for this patent. It is cited to show state of the art.

**DD 280 149 A1**

No abstract available for this patent. It is cited to show state of the art.

**GB 2 022 722 A**

This patent shows a sintered self lubricating bearing comprising at least an area of the inner surface, with a permeability value reduced in respect to that of the remaining mass, the number of reduced permeability areas varying from one to two times the numerical value of the diameter expressed in millimeters.

**JP 11-336760**

The purpose of the invention is to prolong the endurance life of a whirl or the like by suppressing its unstable oscillation. Two bearing surfaces 2b isolated from each other in the axial direction are formed on the inner-periphery surface of a bearing body 2a, and a plurality of dynamic pressure grooves 2c inclined in the axial direction are formed on respective two bearing surfaces 2b. The bearing body 2a, whose main material is one or more metal powder selected from copper, iron, and aluminum, and which is formed out of sintered metal obtained by mixing and sintering, as necessary, powder of nickel, tin, zinc, lead, and graphite or alloyed powder of them, preferably, by mixing 27-97 wt.% of copper so that its density becomes 6.4-7.2 g/cm<sup>2</sup>. A mixture of polyolefin and alphaolefin or its hydride and ester, or ester is used for the base oil of lubricating oil or lubricating grease with which the bearing body 2a is impregnated.

**JP 5-209623**

The purpose of the invention is to provide a durable oil impregnated sintered bearing by maintaining a stable friction characteristic for a long period even under such a severe condition that both a thrust load and a radial load are applied thereto at the same time so as to use the bearing as a substitute for a rolling bearing in a high temperature atmosphere. In an oil impregnated sintered bearing, mixture oil incorporating alkyl diphenyl ether oil and poly-alpha-olefin oil within a range of a mixture ratio of 80:20-20:80% by weight is impregnated in a sintered bearing molding.

**JP 5-071539**

The purpose of the invention is to provide an oil impregnated sintered bearing which can be easily assembled and endure a long time use, and from which less oil scatters or leaks. A bearing body 1 for journaling a rotary shaft 2 is composed of a body part 3 having several pores having a diameter of about 20 to 100 $\mu$ m, and a tapered part 4 having several pores having a diameter of about 100 to 200 $\mu$ m. The body part 3 and the tapered part 4 are integrally incorporated with the use of one and the same material. During operation, oil 6 leaking underneath the rotary shaft 2 is sucked through a taper 5 of the taper part 4, and is effectively returned into the body part 3 by a capillary force with no loss on its way. Further, due to the integral structure, the assembly thereof can be facilitated, and the strength of the bearing can hardly deteriorate.

**JP 2002-310156**

The purpose of the invention is to provide a durable oil-impregnated sintered bearing to reduce frictional resistance of the oil-impregnated sintered bearing and continue its low friction coefficient for a long period and improve quality of a spindle motor. Poly- $\alpha$ -olefin forms base oil and an oil-impregnated sintered bearing is provided to impregnate a lubrication oil composition containing aliphatic monatomic alcohol being 1-12 mass% of the whole of the composition.

**JP 2000-337381**

The purpose of the invention is to prevent the occurrence of whirling noise by forming a boundary section between a central bearing section having an inner periphery parallel with a rotary shaft and a one-end bearing section having an expanding inner periphery into a nonporous surface, forming a boundary section between the central bearing section and the other-end bearing section having an expanding inner periphery into a porous surface, and arranging the one-end bearing section on the shaft end section side. The lubricant of an upper end section side oil retaining bearing 3a drops via gravitational force through the gap between the tapered portion of a one-end bearing section 32a and a rotary shaft 2 and is flooded on the nonporous surface 36a (C). The lubricant in the oil retaining bearing 3a is absorbed from the surface of the central bearing section 3a and fed (D). The lubricant of a lower end section side oil retaining bearing 3b is held by a capillary phenomenon in the gap between the tapered portion of the other-end bearing section 32b and the rotary shaft 2. The lubricant dropping from the nonporous surface 36b of the other-end bearing section 32b is absorbed into an oil retaining bearing 3b and is fed to the sliding face of the rotary shaft 2 via the surfaces of the central bearing section and the other-end bearing section 32b (F), and it drops on the inner periphery of a nonporous surface 34b and is fed (G). An uncomfortable sound can be prevented when the rotary shaft 2 is inclined.

**JP 2000-337380**

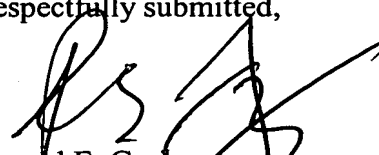
The purpose of the invention is to improve a sliding characteristic by impregnating a bearing member with a lubricant mixed with a specific quantity of perfluoropolyether to a mixture of one or two kinds or more selected from polyalphaolefin, polyol ester and diphenyl

ether into an emulsion. A mixture of one or two kinds or more selected from polyalphaolefin, polyol ester, diphenyl ether, diester oil, mineral oil, alkyl benzene and alkyl naphthalene is used for the base oil of a lubricant composition, and perfluoropolyether of 0.1-30 vol.% is blended with the base oil into an emulsion to obtain a lubricant. A bearing member 1 is made of a porous powder sintered metal, and it is impregnated with the lubricant. The bearing member 1 is provided with bearing sections 2 on both side sections and a middle expansion section 3 at the middle of its inner hole, and the bearing member 1 is pressed into the inner hole of a housing 4 via the outer periphery of the middle expansion section 3, thereby a bearing suitable for a high-speed-rotation small spindle motor or the like is obtained..

Examination of this application is respectfully requested.

Date: \_\_\_\_\_

Respectfully submitted,

  
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**Customer No. 02119**

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Enclosures  
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Substitute for form 1449A/PTO

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Sheet 1 of 2

Complete **10/5/93** **022**

Application Number

Filing Date

First Named Inventor

Gerhard GROSS et al.

**Art Unit**

Examiner Name

Attorney Docket Number

R.308338

**U.S. PATENT DOCUMENTS**

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## FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Remarks
		Office <sup>3</sup>	Number <sup>4</sup>	Kind <sup>5</sup> (if known)				
		DE	1 285 793		12-19-1968	Metallurgie Francaise		
		DE	199 37 567	A1	03-16-2000	Gerd Dornhoefer et al.		
		DE	198 09 770	A1	09-10-1998	Kazuo Okamura et al.		
		DE	196 28 241	A1	01-30-1997	Natsuhiko Mori et al		
		DE	101 07 486	A1	09-12-2002	Guido Kurz et al.		
		DE	101 02 012	A1	08-01-2002	Andreas Ewert et al.		
		DE	43 42 902	A1	06-22-1995	Gerd Dornhoefer et al.		
		DE	1 575 551		01-02-1970	Metallurgie Francaise		
		DD	280 149	A1	06-27-1990	Andre Martin et al.		
		GB	2 022 722	A	12-19-1979	Merisinter S.p.A.		✓

**Examiner  
Signature**

Date  
Considered

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

***If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.***

Substitute for form 1449A/PTO

*(use as many sheets as necessary)*

Sheet 2 of 2

Complete if known **10/5 93 022**

Application Number

Filing Date

First Named Inventor

Gerhard GROSS et al.

## Art Unit

**Examiner Name**

Attorney Docket Number

R.308338

[illegible][illegible]

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Complete if Known **593022**

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Sheet	1	of	1
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<b>Application Number</b>	
<b>Filing Date</b>	
<b>First Named Inventor</b>	Gerhard GROSS et al.
<b>Art Unit</b>	
<b>Examiner Name</b>	
<b>Attorney Docket Number</b>	R.308338

[illegible][illegible]

Examiner  
Signature

Date Considered

<sup>1</sup>EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>2</sup>Applicant's unique citation designation number (optional). <sup>3</sup>See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>4</sup>Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>5</sup>For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>6</sup>Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>7</sup>Applicant is to place a check mark here if English language Translation is attached.

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**SUBMISSION OF PRIOR ART**

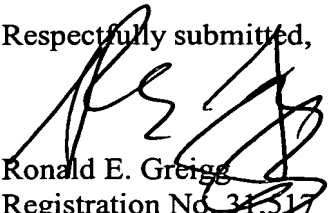
Sir:

The undersigned hereby requests that the prior art cited on the attached form PTO/SB/08a be printed on the bibliographic page of any patent issuing from this application.

The prior art listed on the attached form PTO/SB/08a is prior art which was cited in a Search Report for the International Application which ultimately translated under 35 U.S.C. 371 into this U.S. application.

In the event that the Patent and Trademark Office has not already obtained copies from WIPO, copies of this prior art are enclosed for the examiner's convenience.

Respectfully submitted,

  
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Date: 9/14/2006

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Enclosures

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